DOI: 10.37990/medr.1534407 Med Records 2025;7(1):89-93

MEDICAL RECORDS-International Medical Journal

Research Article

Readability Analysis of Web Pages Providing Information on the Relationship Between Gingival Diseases and Heart Health

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Abstract

Aim: This study aimed to evaluate the readability of Turkish-language texts that provide information about the relationship between gingival diseases and heart health on the internet.
Material and Method: The keywords "gingival diseases and heart health relationship" were entered into the Google search engine. As a result of the search, the first 60 pages with Turkish content that provided patient information on the subject and could be accessed directly without any membership requirement were included in the study. Repeated web pages, academic publications, images, video content, and sites for advertising commercial products were not included in the study. The texts obtained were evaluated according to the Ateşman Readability Index.
Results: Forty-six of the first 60 sites found in the search met the inclusion criteria. When the texts included in the study were examined according to their sources, it was found that 43.5% were pages of dental clinics, 26.1% of private hospitals, 10.9% of university hospitals, 10.9% of media news pages, 4.3% of professional organizations, 2.2% of cardiology clinics and 2.2% of state hospitals. It was determined that 60.87% of the texts on the pages were at "medium" and 39.13% were at "difficult" readability level.
Conclusion: According to the results of the study, it was determined that the informative texts about "The relationship between gingival disease and heart health" published on Turkish websites have medium and difficult readability levels. In order to make such informative texts easier and comprehensible to read, it would be useful to adjust the language level of the text by using readability tools by the author before publication.

Keywords: Readability, internet, gingival diseases, heart health, heart diseases

INTRODUCTION

Internet usage is increasing every year in the world and in Türkiye. According to the results of the "Household Information Technology Usage Survey" conducted by the Turkish Statistical Institute (TÜİK) in 2023, the proportion of households with access to the internet increased to 95.5% and the internet usage rate of individuals aged 16-74 increased to 87.1% (1). According to another survey conducted by TÜİK in 2019, 69.3% of internet users use the internet to obtain information on health-related issues (2). People increasingly turn to the internet to obtain health-related information every year (3). Therefore, websites that provide health-related information should, first of all, be easy to read and understand by people (4). Having reliable and accurate information content is another important dimension.

Readability refers to the degree of ease or difficulty of understanding the text written in any language by the reader (5). Various formulas and indices have been developed to evaluate readability according to objective criteria. For example, while formulas such as SMOG measurement value, Gunning Fog value, Automatic Readability Index, Fresch Reading Ease Score, Flesch-Kincaid Grade Level are frequently used for English, the Ateşman readability formula developed by Ender Ateşman is used for Turkish (6). Ateşman studied texts of different difficulty levels and belonging to different fields and determined an index to classify them according to the level of ease-difficulty for the reader. According to Ateşman's readability index, texts with a score of 90-100 are classified as very easy; 70-89 as easy; 50-69 as medium difficulty; 30-49 as difficult; and 1-29 as very difficult (7) (Table 1). This index is based on

CITATION
Ozgoren O. Readability Analysis of Web Pages Providing Information on the Relationship Between Gingival Diseases and Heart Health. Med Records. 2025;7(1):89-93. DOI:1037990/medr.1534407

Received: 16.08.2024 **Accepted:** 07.11.2024 **Published:** 13.01.2025
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average word and sentence length. The index is calculated with this formula : 198,825 - (40,175 x Average Word Length) - (2,610 x Average Sentence Length).

Table 1. Readability classification according to the Ateşman readability index range

Ateşman readability classification	
Very easy	90-100
Easy	70-89
Medium difficult	50-69
Difficult	30-49
Very difficult	1-29

The degree of ease and difficulty of a text depends, of course, on the level of education of the reader. The higher the level of education, the higher the degree of comprehension of difficult texts. Flesch's Ease of Reading classification is used in this regard. Ateşman took this classification as a basis when he created his own readability classification. According to this classification, the text is scored between 1 and 100 to determine the level of education at which it is easily comprehensible. A score of 100 indicates that the text is easily comprehensible even by individuals with the lowest level of education and therefore has a high readability (Table 2) (8). As the readability level of a text decreases, the effectiveness of the information and directions on the web page will also decrease (9).

Table 2. Readability classification according to the Flesch readability index range

Flesch readability classification	
Grade 4 and below	90-100
5-6. grade	80-89
7-8. grade	70-79
9-10. grade	60-69
11-12. grade	50-59
Associate degree	40-49
Bachelor's degree	30-39
Postgraduate	1-29

Periodontal diseases are chronic or acute inflammatory destructive diseases affecting the teeth and their supporting tissues. It is highly prevalent worldwide, with an estimated prevalence of 20%-50%, increasing with age (10). Since it is an infectious, inflammatory disease, inflammatory mediators and other disease-causing agents that spread throughout the body through blood and saliva during the disease have the potential to spread to many different parts of the body and directly or indirectly cause disease in other organs. Scientific studies have shown that periodontal diseases are associated with many systemic diseases (11-14). One of these is cardiovascular diseases (CVD). CVD is one of the leading causes of death worldwide (15,16). Apart from known risk factors, there is evidence that inflammation plays an important role in the development of CVD, suggesting that periodontal diseases, which have an inflammatory character, may be associated with the development of CVD (17,18). In many studies examining the relationship between periodontal diseases and CVD, it has been reported that advanced periodontal disease poses a 25-90% risk of CVD (19,20). Based on a review of large-scale studies on the subject, the American Heart Association has evaluated periodontal diseases as a risk factor for atherosclerotic vascular diseases independent of other risk factors. Studies on the direct or indirect effects of pathogenic bacteria causing periodontal diseases and the inflammatory response caused by them on CVD formation are ongoing (14).

Today, when the relationship between periodontal diseases and CVD is becoming clearer and stronger with scientific studies, informing the public about this issue is of great importance in terms of protecting public health. In the report published by Scannopieceo et al. on the prevention of periodontal diseases in 2020, the importance of informing the public on the subject was pointed out in terms of protecting periodontal health (21). Today, one of the most practical and preferred ways of accessing information is the internet. Many people, in order to obtain information about the subjects they are curious about, search for the subject in search engines and utilize the information on the web pages they come across. Of course, the accuracy of this information as well as its comprehensibility, i.e. readability, is of great importance. It should not be ignored that people from all levels of education can access this information on the internet. In order for this tool, which is widely used to deliver information to the society, to be used correctly and effectively, texts containing information should be as easy to read as possible. This will be more efficient in terms of social benefit, as it will ensure that the text is understandable by all segments of society.

Since periodontal diseases are commonly referred to as “gum disease”, we preferred the expression “gum disease” when searching in the search engine. Similarly, since “cardiovascular diseases”, which is a general expression that includes many diseases, is not an expression used among the public, we preferred the expression “heart health”, which is a more common and general expression among the public. Since the shortest and most general expressions are preferred when searching in search engines, we made our search as “gum disease and heart health relationship”. We think that by analyzing the readability of the texts with information content as a result of such a search, we will contribute to the texts to be created on the subject to reach their purpose more effectively.

MATERIAL AND METHOD

Since publicly available information was used in this study, ethics committee approval was not required.

In order to access informative texts on the internet about the relationship between gingival disease and heart health, a search was performed by a researcher by typing the keywords in Turkish 'Dişeti hastalıkları ve kalp sağlığı ilişkisi' into the Google search engine in June 2024. Academic publications, images, video content, sites for advertising commercial products, forum sites, and sites requiring membership were not included in the study. Turkish websites containing texts for patient information and education about the relationship between gingival disease and heart health were included. The texts were classified according to their sources as private hospitals, university hospitals, public hospitals, private dental clinics, cardiology clinics, professional organizations and media news pages. To determine readability levels, text content was transferred to a free online readability calculator using the Ateşman readability formula (http://okunabilirlikindeksi.com). The data obtained were exported to Microsoft Excel (Microsoft Corporation, Redmond, Washington, USA).

Statistical Analysis

The data obtained in the study were evaluated using the SPSS 26 (SPSS Inc., Chicago, IL, ABD) package program. Descriptive statistical methods were used in the evaluation of the data obtained. Data were expressed as percentage (%), arithmetic mean, standard deviation, minimum and maximum. Readability index values were classified according to Ateşman readability classification.

RESULTS

After typing keywords into the search engine, 46 of the first 60 web pages that met the criteria were used in the study. When the texts included in the study were examined according to their sources, it was found that 43.5% were pages of dental clinics, 26.1% of private hospitals, 10.9% of university hospitals, 10.9% of media news pages, 4.3% of professional organizations, 2.2% of cardiology clinics and 2.2% of state hospitals (Table 3). Descriptive statistics of the texts in terms of language are given in Table 4.

Table 3. Distribution of web pages according to text source

	n	%
Dental clinics	20	43.5
Private hospitals	12	26.1
Media news pages	5	10.9
University hospitals	5	10.9
Professional organizations	2	4.3
Cardiology clinics	1	2.2
State hospitals	1	2.2

Table 4. Descriptive statistics of the texts in terms of language

	Mean	Standard deviation	Minimum	Maximum
Number of words	667.43	393.00	218	2234
Number of characters	5264.24	3226.26	1819	18996
Number of difficult words	660.33	391.68	215	2221
Unique words	398.61	202.71	145	1156
Number of short words	144.46	82.75	40	411
Characters without spaces	4579.20	2825.86	1591	16693
Number of sentences	54.85	38.18	12	217
Number of paragraphs	23.96	19.30	4	91
Average word length	2.77	0.13	3	3
Average sentence length	13.27	3.33	8	20
Ateşman readability index	52.86	9.68	32	70

The mean Ateşman readability index was 52.86±9.68. The percentage distribution diagram of the readability level of the web pages according to the Ateşman readability index values is shown in Figure 1 based on Ateşman readability classification (Table 1). According to the available data, 60.87% of the websites were found to be at medium and 39.13% at difficult readability level. The Ateşman readability levels of the web pages according to the sources are shown in Table 5, and according to the Flesch classification (Table 2).

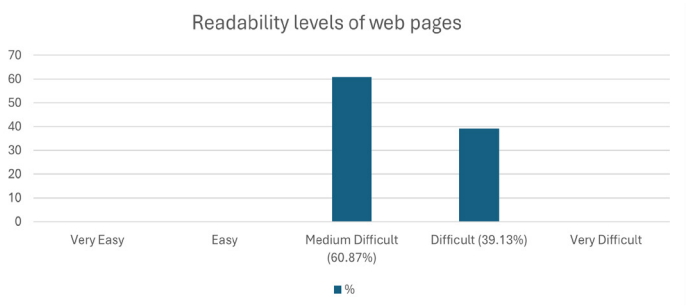

Figure 1. Distribution diagram of readability level of web pages

Table 5. Ateşman readability levels according to sources

	Very easy	Easy	Medium difficult	Difficult	Very difficult	Total
State hospitals	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%
Cardiology clinics	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%
Media news pages	0.00%	0.00%	80.00%	20.00%	0.00%	100.00%
Professional organizations	0.00%	0.00%	50.00%	50.00%	0.00%	100.00%
Dental clinics	0.00%	0.00%	55.00%	45.00%	0.00%	100.00%
Private hospitals	0.00%	0.00%	91.70%	8.30%	0.00%	100.00%
University hospitals	0.00%	0.00%	40.00%	60.00%	0.00%	100.00%

DISCUSSION

Nowadays, with the widespread use of the internet, when people experience a health problem, they first research about the subject on the internet. In recent years, the number of publications in both print and visual media expressing the relationship between gingival diseases and general body health has been increasing. Especially the relationship between gingival diseases and cardiovascular diseases, which has been increasing in recent years, and the public awareness of this relationship is important for public health. This study is the first study to investigate the level of readability of information about the relationship between gingival diseases and heart health on Turkish websites. In the literature, there is only one study evaluating Turkish information texts about "gingival disease" (22,23).

While searching on the subject; the search engine was searched by typing the simplest expressions that the public would use. Since Google is the most widely used search engine in Türkiye, Google search engine was preferred in our study (24,25). The readability levels of the resulting texts were found to be at the level of medium difficult and difficult. In the readability analysis study on "Gum disease" previously available in the literature, it was determined that the texts were of medium difficulty. In order for the general public to understand the subject easily, it is recommended that the readability should be at the "easy" level and not higher than the 6th-8th grade level (24). In our study, no text sources were identified that fit this range. 39.13% of the texts were difficult and 60.87% were of medium difficulty. It was observed that the sentence and word lengths were higher than the average values determined by Ateşman for Turkish and the amount of difficult words was also high. According to Ateşman, the definition of difficult words refers to words other than the 3000 most frequently used words in Turkish (7). According to TÜİK data, the average duration of education in Türkiye in 2023 is 9.3 years. Only 48.3% of the population has secondary education and above (26). Therefore, the readability level of the texts subject to our research shows that the texts are not fully comprehensible by almost half of the population. Moreover, 39.13% of the texts are difficult to read. In order for these texts to be fully understood, education at associate's and bachelor's level is required. However, according to the same data, the rate of people with higher education in our country is 24.6% (26). In other words, the texts in question are fully comprehensible by only 24.6% of the population. Therefore, in our study, it has been determined that the language of the texts should be simplified in order for the texts in question to fully achieve their goals and to be understandable by all segments of the public.

CONCLUSION

It was observed that the readability level of the web pages providing information on the relationship between gingival diseases and heart health was at the "moderately difficult" and "difficult" level. It is important that such informative web pages are easily understandable by large segments of the public in order to achieve the informative purpose. In such issues that directly concern public health, it is important that the texts prepared should be as simple and clear as possible. In our study, we concluded that these texts do not fully serve their purpose in their current form. We believe that it would be much more efficient and effective in terms of informing the public and thus public health if those who prepare articles on such issues, which are very important for public health, make use of readability tools that are available free of charge on the internet.

Financial disclosures: *The authors declared that this study has received no financial support.*

Conflict of interest: *The authors have no conflicts of interest to declare.*

Ethical approval: *Since publicly available information was used in this study, ethics committee approval was not required.*

REFERENCES

1. Türkiye İstatistik Kurumu. Hane halkı bilişim teknolojileri (BT) kullanım araştırması 2023. data.tuik.gov.tr/Bulten/Index?p=Hanehalki-Bilisim-Teknolojileri-(BT)-Kullanim-Arastirmasi-2023-49407 access date 25.07.2024.
2. Deniz S. A study on the e-health literacy and cyberchondria levels of individuals. İnsan ve İnsan. 2020;7:84-96.
3. Lenhart A, Horrigan J, Rainie L, et al. The ever-shifting Internet population. a new look at Internet access and the digital divide. Washington, DC: Pew Internet&American Life Project. 2003 Apr 1. http://pewrsr.ch/1iQ8PW3 access date 25.07.2024.

4. Tolu S, Basım P. A new perspective on readability and content assessment of patient information texts published on the İnternet sites on lymphedema. J Curr Res Health Sector. 2018;8:303-14.

5. Çoban A. Okunabilirlik kavramına yönelik bir derleme çalışması. Dil ve Edebiyat Eğitimi Dergisi. 2014;1:96-111.

6. Bezirci B, Yilmaz AE. A software library for measurement of readability of texts and a new readability metric for Turkish. DEÜ Mühendislik Fakültesi Fen Bilimleri Dergisi. 2010;12:49-62.

7. Ateşman E. Measuring readability in Turkish. AU Tömer Language Journal. 1997;58:71-4.

8. Flesch R. A new readability yardstick. J Appl Psychol. 1948;32:221-33.

9. Edmunds MR, Denniston AK, Boelaert K, et al. Patient information in Graves' disease and thyroid-associated ophthalmopathy: readability assessment of online resources. Thyroid. 2014;24:67-72.

10. Williams RC. Periodontal disease. N Engl J Med. 1990;322:373-82.

11. Grossi SG, Genco RJ. Periodontal disease and diabetes mellitus: a two-way relationship. Ann Periodontol. 1998;3:51-61.

12. Tonetti MS, Dyke TE. Periodontitis and atherosclerotic cardiovascular disease: consensus report of the Joint EFP/AAP Workshop on Periodontitis and Systemic Diseases. J Clin Periodontol. 2013;84:S24-9.

13. Scannapieco FA, Cantos A. Oral inflammation and infection, and chronic medical diseases: implications for the elderly. Periodontol 2000. 2016;72:153-75.

14. Schenkein HA, Loos BG. Inflammatory mechanisms linking periodontal diseases to cardiovascular diseases. J Clin Periodontol. 2013;40:S51-69.

15. Luepker RV. Cardiovascular disease: rise, fall, and future prospects. Annu Rev Public Health. 2011;32:1-3.

16. Nabel EG. Cardiovascular disease. N Engl J Med. 2003;349:60-72.

17. Mattila KJ, Nieminen MS, Valtonen VV, et al. Association between dental health and acute myocardial infarction. BMJ. 1989;298:779-81.

18. Simonka M, Skaleric U, Hojs D. Condition of teeth and periodontal tissue in patients who had suffered a heart attack. Zobozdrav Vestn. 1988;43:81-3.

19. Arbes Jr SJ, Slade G, Beck J. Association between extent of periodontal attachment loss and self-reported history of heart attack: an analysis of NHANES III data. J Dent Res. 1999;78:1777-82.

20. Janket S-J, Baird AE, Chuang S-K, Jones JA. Meta-analysis of periodontal disease and risk of coronary heart disease and stroke. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2003;95:559-69

21. Scannapieco FA, Gershovich E. The prevention of periodontal disease—An overview. Periodontology 2000. 2020;84:9-13.

22. Kanmaz B, Buduneli N. Evaluation of information quality on the internet for periodontal disease patients. Oral Diseases. 2021;27348-56.

23. Taşdemir İ. Readability analysis of information about gingival disease on the internet . Selcuk Dental Journal. 2023;10:89-93.

24. Badarudeen S, Sabharwal S. Assessing readability of patient education materials: current role in orthopaedics. Clin Orthop Relat Res. 2010;468:2572-80.

25. Akbulut AS. Readability Analysis of information on the internet about clear aligner treatment. NEU Dent J. 2022;4:7-11.

26. Türkiye İstatistik Kurumu. Ulusal eğitim istatistikleri 2023. data.tuik.gov.tr/Bulten/Index?p=Ulusal-Egitim-Istatistikleri-2023-53444 access date 25.07.2024.